

A CATALOGUE OF MOSSES FOR THE CITY AND COUNTY OF  
SAN FRANCISCO, CALIFORNIA

JAMES R. SHEVOCK AND DAVID TOREN

Department of Botany, California Academy of Sciences Golden Gate Park,  
San Francisco, CA 94118-4599

ABSTRACT

The moss component for the bryoflora for the City and County of San Francisco contains 128 species representing over 22 percent of the California moss flora. Several mosses are suspected as being introduced since the mid-1900s and have subsequently become established and naturalized. A large component of the moss flora of San Francisco represents cosmopolitan species having wide geographical distributions. All but twelve of the 42 species based on the historic Bolander moss collections attributed to San Francisco from the 1860s were relocated during this study. Sixty-five mosses are reported for the first time from the City and County of San Francisco. Of these, the rare species *Triquetrella californica* (Lesq.) Grout is also documented for San Francisco. *Bryum pyriferum* Crundw. & H. Whiteh., *Campylopus pyriformis* (F. Schultz) Bridel, *Heterocladium dimorphum* (Brid.) Schimp. in B.S.G., *Sematophyllum adnatum* (Michaux) Britton and *Zygodon menziesii* (Schwaegr.) Arnott are reported new for California and *Zygodon menziesii* is reported new for North America.

What is today the city of San Francisco began at Mission Dolores when Spanish priests and soldiers established a mission on June 29, 1776. Since the California gold rush of 1849, San Francisco has functioned as a center for immigration, a focal point of commerce and as a financial center. Botanists too generally entered California via San Francisco (Slack 1993). Surrounded on three sides by the Pacific Ocean and San Francisco Bay, the City and County of San Francisco is contained at the tip of the San Francisco Peninsula, a compact rectangular area of 128 sq. km. (47 sq. mi.). Built on 43 hills, the City and County elevation ranges from sea level to 282.5 m. (927 ft.) at the summit of Mt. Davidson. Twin Peaks at 281 m. and 275 m. along with Mt. Sutro at 277 m. are the highest points near the geographic center of the City and County of San Francisco. With a population of 770,000, San Francisco is the second most densely populated American city after New York. The Bay Area metropolitan area is the Nation's fifth largest and the workday population of San Francisco swells to over 1.5 million (San Francisco Convention and Tourism Bureau).

During the past 150 years San Francisco has undergone phenomenal development with an associated loss of native habitats (Eastwood 1945, Howell 1934 and Howell, Raven & Rubtzoff 1958). As early as 1891, these landscape changes were already evident. In her introduction to the flora of San Francisco, Brandegee (1891) states "that the number of plants is not greater is due not only to the destruction of native species, caused by the cutting down of hills, filling of swamps and burying streams incident to the growth of a large city, but even more to the lack of variety in climate and conditions, the city being surrounded on three sides by water and swept by ocean winds." While several portions of

the City and County remained undeveloped up until the 1940s, it was in the aftermath of WW II that many natural wild areas were rapidly developed for residential use in San Francisco (Howell, Raven & Rubtzoff 1958). While much of the original landscape was altered or converted to residential and high rise office buildings in subsequent decades, the City and County of San Francisco nonetheless still contain several areas of open space from landscaped parks to undeveloped hills where remnants of native vegetation still persist. In other areas, non-native plantations dominated by *Eucalyptus globulus* Labill. and *Cupressus macrocarpa* Gordon (although the latter is native to other coastal areas of California) contributed to the replacement of the natural vegetation. These plantations, now approaching 100 years old, provide many microhabitats for the establishment of moss populations.

*History of moss collecting in San Francisco.* Yerba Buena (the earlier name for San Francisco), was the northernmost expansion of Spanish rule in North America. There appear to be no moss collections obtained during the Spanish era between 1776 and 1821. Neither were moss collections made during the Mexican period from 1821 to 1846 when the United States declared war on Mexico. Yerba Buena was renamed San Francisco in 1847 and Alta California was transferred by treaty from Mexico to the United States in 1848. California was admitted to the Union as the 31st state in 1850. Moss collecting in San Francisco apparently began in the 1860s when Brewer collected *Bryum argenteum* near Mission Dolores in 1862, Kellogg collected *Alsia californica* from Lone Mountain in 1866 and Bolander collected several mosses at Mission Dolores and Fort Point in 1868. Earlier collectors of mosses in California include Sullivant in

1853 and Lesquereux in 1865 but label data are absent to conclude that any of their collections were obtained from San Francisco (Thiers & Emory 1992). Bolander, who was employed for a short time as a botanical assistant for the State Geological Survey, was the principal collector of mosses in California in the 1860s. His collections added significantly to the catalogue of mosses known from California (Lesquereux 1868 & Watson 1880), now evident in several taxa named to commemorate him.

Brandege (1891) consolidated the Bolander collections housed at the University Herbarium, University of California and added a list of mosses to her San Francisco vascular plant flora. The moss flora was based on species concepts of that time and comprised 42 taxa. Bolander's label information, although standard for that era, was very sparse. It is difficult to determine exactly where many of the San Francisco specimens were obtained beyond the few references to Mission Dolores and Fort Point. There appears to be no published record to indicate the level of effort Bolander invested in his moss collecting endeavors within San Francisco.

In addition to these early field workers, several other botanists, known nearly exclusively for their flowering plant collecting and floristic publications, also collected mosses in San Francisco during their careers. Collections were made by Alice Eastwood in 1923, by Peter Raven in 1949, 1950 and 1954, by Frederick J. Hermann in 1962 and by John Thomas Howell in 1969. Among Peter Raven's first botanical collections were mosses obtained from Golden Gate Park when he was fourteen years old which he brought to the Academy of Sciences. Leo Koch and Fay MacFadden, the prominent field bryologists during this period, identified them.

We undertook this study to determine how many of the mosses obtained by Bolander, as reported by Brandege (1891), Lesquereux (1868), and Watson (1880), and from subsequent collectors, could be re-located within the City and County of San Francisco after 130 years of substantial land-use changes. We also wanted to know if we could document mosses that were overlooked by Bolander and subsequent collectors and determine if additional mosses, such as introduced exotics, are now becoming a naturalized component of the bryoflora of California. Our field collecting began in the fall of 1999 and concluded in the fall of 2000. Together we obtained 668 moss collections representing 112 species within the City and County of San Francisco. Sixteen taxa reported by earlier collectors from San Francisco were not relocated during this study. Of this total, twelve were Bolander collections dating from 1868. We believe that potential habitat still remains within the City and County for most of these taxa, even though we did not encounter them during our study. Five of these taxa are soil ephemerals that can be easily overlooked. Only

three species, *Fontinalis neomexicana*, *Orthotrichum rivulare* and *Pohlia wahlenbergii* appear to be extirpated from the City and County of San Francisco through loss of suitable habitat. Several mosses were routinely encountered on a variety of habitats and substrates while others appear to be locally uncommon or restricted. The number of collections cited for each species is a good approximation of whether it is a common or a rare component of the moss flora in the City and County of San Francisco.

*Fragmentation of habitats and associated substrates available for moss establishment.* Today, remnants of free-flowing creeks and fragments of native vegetation ranging from sand dunes and northern coastal scrub to serpentine grasslands can still be found in San Francisco. Salt and fresh water marshes have been drained and filled decades ago but are beginning to re-establish on fill land. In the areas where small lakes (ponds) remain, the natural flow of water has been altered along with great changes in water chemistry. Most of these bodies of water are no longer viable for the establishment of mosses, primarily a result of algal concentrations and/or presence of pollutants such as those in storm run-off from streets. Nearly all of the forested habitat is the result of tree plantations or trees that became established and spread from initial plantings that date from the 1870s to the 1920s (McClintock & Moore 1965).

Several city parks are located throughout the City and County. The largest is Golden Gate Park at 407.5 hectares (1007 ac.). The Presidio and Golden Gate National Recreation Area, managed by the National Park Service provides a federal contribution to open space in the City and County of San Francisco. The most protected landscape within the County of San Francisco is the Farallon Islands National Wildlife Refuge, managed by the U.S. Fish & Wildlife Service. These isolated, barren, wind-swept granitic islands are home to thousands of breeding oceanic birds and pinnipeds and are closed to public access. Today several conservation efforts are ongoing to either maintain or restore native plant habitats from sand dunes and northern coastal scrub to serpentine grasslands. Management for endangered species is a catalyst for these various restoration efforts in San Francisco. Public debate will also focus on the long-term management of the extensive mature *Eucalyptus* plantations on Mt. Sutro, Mt. Davidson, and Monterey cypress plantations in the Presidio.

*Floristic Analysis.* Most of the scientific names applied to the Bolander collections have since been modified based on either replacement of misapplied European moss names or changes in species concepts as well as generic placement. When the species circumscription differs from the name referenced by Brandege (1891) Lesquereux (1868) or Watson (1880), we have provided the synonymy as

far as we can determine it for that specimen. We have attempted to locate all of the Bolander collections obtained from San Francisco. We also cite the herbaria and collectors where other San Francisco specimens are deposited. One feature of this specimen-based catalogue is to list for each taxon the earliest collection date found among herbarium records examined. The California Academy of Sciences began operation in 1853. We speculate, however, that some moss specimens from the Bolander era may also have been lost in the 1906 earthquake and fires that ravaged the City and damaged the California Academy of Sciences building which was at that time located on Market Street.

Distribution of mosses within the City and County of San Francisco is directly related to substrate preference and habitat availability (Table 1). The number of mosses occurring within the study area is, in our view, relatively species rich for such a highly urbanized area. We were, however, surprised by the number of common coastal species of the California bryoflora found in adjacent Marin and San Mateo counties that were not encountered during this study. We attribute these "missing taxa" to several factors. San Francisco seems to have lacked a native coast redwood forest similar to that found in the vicinity of Mt. Tamalpais in Marin County to the north or in the Santa Cruz Mountains region in Santa Cruz and San Mateo counties to the south. According to historic accounts trees were an uncommon feature of the San Francisco landscape (Howell, Raven & Rubtzoff 1958). This lack of native forests in San Francisco is most likely the result of the strong winds that regularly channel through the San Francisco Bay and the extensive sand dune system that covered the western portion of San Francisco. Whatever native forest stands did exist were restricted to the higher peaks and then probably heavily utilized for both lumber and fuel wood consumption during the early years of growth of both Mission Dolores and the Presidio of San Francisco.

Compared with other tree species along the coast, such as *Acer macrophyllum* Pursh, *Alnus rubra* Bong., *Quercus spp.*, and *Umbellularia californica* (Hook & Arn.) Nutt., the bark of both *Eucalyptus* and *Cupressus* appears to be limiting as a primary substrate supporting moss colonization. Where *Eucalyptus* dominates, its bark shedding characteristic coupled with a thick leaf litter can be quite an impediment to moss colonization that prefer soil or bark. Even where moss occurs on the trunks and bases of *Eucalyptus*, it is not widespread within a particular stand of trees. There appears to be a considerable amount of unoccupied habitat. The bark of *Cupressus macrocarpa* is well furrowed and thick, but we speculate that its density and composition does not readily permit moisture absorption. Even when wetted, the bark dries quickly. This would seem to explain why mosses are infrequently encountered on Monterey cypress

except at the very base, among buttresses, or exposed roots. Bark chemistry may also be a factor in limiting moss colonization on Monterey cypress. Aside from these factors, the cypress canopies are nearly impervious to all but the heaviest rain, and this coupled with a outwardly descending branch arrangement moves moisture away from the trunk. The area beneath cypress trees is therefore dry much of the year. Stands of horticultural pines dominated by Monterey pine (*Pinus radiata* D. Don), while covered in lichens, generally lack mosses altogether. Again we speculate that the bark is not a suitable substrate for moss colonization within the climatic parameters present in San Francisco.

Many wooded or forested areas are also choked with a dense understory of non-natives dominated by French broom (*Genista monspessulana* (L.) L. Johnson), English ivy (*Hedera helix* L.), Cape ivy (*Delairea odorata* Lem.), nasturtium (*Tropaeolum majus* L.) and/or Himalayan blackberry (*Rubus discolor* Weihe & Nees). Only grasslands provide relatively open patches of gravelly or rocky soils where mosses have a chance to compete. Another major factor influencing moss colonization relates directly to the geological parent rock material. Franciscan chert, the most common rock type in San Francisco appears to be a poor substrate for the establishment of mosses due to its flaking and fracturing characteristics. Other rock types are rare to uncommon within the City and County and that limits the potential for establishment of species that prefer a different rock or soil chemistry. For example, granitic rocks are only present at the Farallon Islands and limestone is completely lacking. Only one rocky outcrop was found to contain enough lime to support a colony of *Gymnostomum aeruginosum*, an obligate calciphile. Besides rock and tree substrates that influence moss colonization, desiccation is also a factor due to the strong winds that frequently channel across the City from the Pacific Ocean.

Several cosmopolitan species are quite successful in the City and County and can be found on a wide assortment of substrates such as concrete retaining walls, bricks, sidewalks, and even asphalt. *Bryum*, *Didymodon*, *Grimmia*, *Syntrichia* and *Tortula* species are relatively common on such substrates. Besides the widespread taxa, a few species in San Francisco are clearly elements of other bryofloras that we view as representing recent introductions to California. Exactly when these taxa were introduced remains speculative, but a few have been around for several decades and can be considered naturalized in California. These introduced mosses include *Bryum pyriferum*, *Calliergonella cuspidata*, *Campylopus introflexus*, *Campylopus pyriformis*, *Campylopus subulatus*, *Heterocladium dimorphum*, *Sematophyllum adnatum*, *Vesicularia vesicularis* and *Zygodon menziesii*. Of these taxa, *Bryum pyriferum*, *Campylopus pyriformis*, *Heterocladium dimorphum*, *Sematophyllum adnatum* and *Zygodon*

TABLE 1. GENERALIZED HABITAT PREFERENCES FOR MOSSES IN SAN FRANCISCO.

---

Soil and gravels

*Atrichum undulatum*  
*Barbula convoluta*  
*Bryum argenteum*  
*Bryum bicolor*  
*Bryum canariense*  
*Bryum capillare*  
*Bryum gemmascens*  
*Bryum gemmilucens*  
*Bryum lisae*  
*Bryum pseudotriquetrum*  
*Bryum torquescens*  
*Ceratodon purpureus*  
*Claopodium whippleanum*  
*Dicranella heteromalla*  
*Dicranella howei*  
*Dicranella varia*  
*Didymodon insulanus*  
*Didymodon umbrosus*  
*Didymodon vinealis*  
*Ditrichum ambiguum*  
*Ditrichum schimperi*  
*Epipterygium tozeri*  
*Fissidens bryoides longifolius*  
*Fissidens crispus*  
*Fissidens curvatus*  
*Fissidens minutulus*  
*Fissidens sublimbatus*  
*Funaria hygrometrica*  
*Funaria muhlenbergii*  
*Homalothecium arenarium*  
*Kindbergia praelonga*  
*Pohlia nutans*  
*Polytrichastrum alpinum*  
*Polytrichum juniperinum*  
*Polytrichum piliferum*  
*Pseudocrossidium obtusulum*  
*Pseudotaxiphyllum elegans*  
*Scleropodium californicum*  
*Scleropodium cespitanus*  
*Scleropodium julaceum*  
*Syntrichia amplexa*  
*Syntrichia bolanderi*  
*Timmiella anomala*  
*Timmiella crassinervis*  
*Tortula obtusifolia*  
*Triquetrella californica*  
*Weissia controversa*

Ephemeral mosses on soil (observed primarily during winter months)

*Acaulon rufescens*  
*Chenia leptophylla*  
*Entosthodon bolanderi*  
*Ephemerum serratum*  
*Fissidens bryoides longifolius*  
*Fissidens crispus*  
*Fissidens curvatus*  
*Fissidens minutulus*  
*Fissidens sublimbatus*  
*Funaria muhlenbergii*  
*Henediella heimii*  
*Henediella stanfordensis*  
*Microbryum starkeanum*

---

TABLE 1. CONTINUED.

---

*Phascum cuspidatum*  
*Pleuridium acuminatum*  
*Pleuridium sublatum*  
*Pseudocrossidium obtusulum*

Rock outcrops

*Anacolia menziensis*  
*Bartramia stricta*  
*Bryum canariense*  
*Bryum capillare*  
*Bryum pyriferum*  
*Campylopus introflexus*  
*Dicranella heteromalla*  
*Dicranoweisia cirrata*  
*Didymodon vinealis*  
*Grimmia laevigata*  
*Grimmia lisae*  
*Grimmia montana*  
*Grimmia pulvinata*  
*Grimmia trichophylla*  
*Homalothecium arenarium*  
*Homalothecium nuttallii*  
*Isothecium cristatum*  
*Kindbergia praelonga*  
*Plagiothecium laetum*  
*Polytrichum juniperinum*  
*Polytrichum piliferum*  
*Porotrichum bigelovii*  
*Pterogonium gracile*  
*Scleropodium californicum*  
*Syntrichia amplexa*  
*Syntrichia princeps*  
*Triquetrella californica*

Leaf litter

*Dicranum howellii*  
*Eurhynchium hians*  
*Homalothecium arenarium*  
*Kindbergia oregana*  
*Kindbergia praelonga*

Tree trunks, branches or exposed roots

*Alsia californica*  
*Amblystegium serpens*  
*Antitrichia californica*  
*Bryolawtonia vancouveriensis*  
*Bryum argenteum*  
*Bryum canariense*  
*Campylopus subulatus*  
*Dicranoweisia cirrata*  
*Dicranum fuscescens*  
*Heterocladium dimorphum*  
*Isothecium cristatum*  
*Isothecium myosuroides*  
*Isothecium spiculiferum*  
*Orthotrichum consimile*  
*Orthotrichum diaphanum*  
*Orthotrichum lyellii*  
*Orthotrichum tenellum*  
*Pterogonium gracile*  
*Syntrichia pagorum*  
*Syntrichia princeps*  
*Tortula papillosa*  
*Tortula plinthobia*  
*Zygodon menziesii*  
*Zygodon rupestris*

---

TABLE 1. CONTINUED.

## Rotten wood and logs

*Amblystegium serpens*  
*Aulacomnium androgynum*  
*Dicranoweisia cirrata*  
*Isothecium cristatum*  
*Isothecium myosuroides*  
*Isothecium spiculiferum*  
*Kindbergia oregana*  
*Kindbergia praelonga*  
*Orthodicranum tauricum*  
*Plagiothecium laetum*  
*Sematophyllum adnatum*

## Seeps and wet places

*Amblystegium juratzkanum*  
*Amblystegium serpens*  
*Brachythecium asperrimum*  
*Brachythecium rutabulum*  
*Brachythecium salebrosum*  
*Bryum capillare*  
*Crumia latifolia*  
*Didymodon tophaceus*  
*Drepanocladus aduncus*  
*Fontinalis neomexicana*  
*Gymnostomum aeruginosum*  
*Hygroamblystegium tenax*  
*Kindbergia oregana*  
*Kindbergia praelonga*  
*Leptobryum pyriforme*  
*Leptodictyum riparium*  
*Orthotrichum rivulare*  
*Pohlia wahlenbergii*  
*Porotrichum bigelovii*  
*Scleropodium cespitans*  
*Scleropodium colpophyllum*  
*Scleropodium julaceum*  
*Scleropodium obtusifolium*  
*Scleropodium touretii*  
*Vesicularia vesicularis*

## Lawns

*Amblystegium serpens*  
*Brachythecium asperrimum*  
*Brachythecium rutabulum*  
*Calliergonella cuspidata*  
*Campylopus pyriformis*  
*Kindbergia praelonga*  
*Leptodictyum riparium*  
*Rhytidiadelphus squarrosus*  
*Scleropodium californicum*  
*Scleropodium cespitans*  
*Scleropodium colpophyllum*

## Concrete walls, bricks, sidewalks, buildings, asphalt

*Bryum argenteum*  
*Bryum capillare*  
*Ceratodon purpureus*  
*Didymodon australasiae*  
*Didymodon nicholsonii*  
*Didymodon rigidulus*  
*Didymodon umbrosus*  
*Didymodon vinealis*  
*Funaria hygrometrica*  
*Grimmia pulvinata*  
*Homalothecium nuttallii*  
*Isothecium cristatum*

TABLE 1. CONTINUED.

*Orthotrichum diaphanum*  
*Orthotrichum tenellum*  
*Philonotis capillaris*  
*Syntrichia ruralis*  
*Syntrichia princeps*  
*Tortula atrovirens*  
*Tortula brevipes*  
*Tortula latifolia*  
*Tortula muralis*  
*Tortula obtusifolia*  
*Tortula papillosa*

*menziesii* are new additions to the California bryoflora. *Zygodon menziesii*, native to Chile, Australia and New Zealand is reported here for the first time in North America. Considering the number of potential introduction sites from the horticultural trade and the diversity of cultivated plants imported from all over the world to San Francisco, it is somewhat remarkable that so few exotic mosses have actually become established and naturalized. It seems likely that both habitat and substrate availability coupled with climatic factors are indeed real barriers to moss establishment in San Francisco. Mosses not accustomed to a Mediterranean-type environment with growth primarily restricted to the cool wet winter season followed by an extended summer drought period are unlikely to become a naturalized component of the California bryoflora. The four highest peaks in the City also form a rain shadow effect that is quite evident during the summer fog periods. The *Eucalyptus* plantations on Mt. Sutro and Mt. Davidson during the summer months are commonly engulfed in fog while the eastern portion of the City remains relatively sunny and dry. The associated fog drip may account for the diversity of mosses encountered on these two peaks within the City and County of San Francisco.

## ACKNOWLEDGMENTS

We thank the San Francisco Recreation and Parks Department, Presidio Trust, Golden Gate National Recreation Area, National Park Service and Farallon National Wildlife Refuge, U.S. Fish & Wildlife Service for providing collecting permits to sample various habitats for this study. Vouchers of our moss collections are placed in the herbarium of the Department of Botany, California Academy of Sciences, Golden Gate Park (CAS). In addition, we have also cited the herbaria where duplicates have been deposited, primarily MO, NY, and UC. Jake Sigg and Peter Holloran provided habitat comments to an early draft of this paper and Steve Jessup and Brent Mishler, as peer reviewers, provided several comments that greatly improved the final product. We also thank several bryologists for providing specimen identifications or verifying our determinations. Special thanks to Drs. Jan-Peter Frahm (*Campylopus*), Brent Mishler (*Syntrichia* & *Tortula*), Jesús Muñoz (*Grimmia*), Ronald Pursell (*Fissidens*), John Spence (*Bryum*), Dale Vitt (*Orthotrichum* & *Zygodon*) and Richard Zander (Pottiaceae). These various contributions are referenced directly with the specimen cita-

tion in this catalogue. Finally, we thank Dan Norris who has been extremely helpful and supportive throughout this project. He provided determinations or confirmations for many specimens in this catalogue and he has inspired us to work on moss floristics.

## LITERATURE CITED

- BRANDEGEE, K. 1891. A list of the mosses of San Francisco, California. [an appendix to flowering plants and ferns of San Francisco]. *Zoe* 2: 384–386.
- EASTWOOD, A. 1945. The wildflower gardens of San Francisco in the 1890s. *Leaflet West. Bot.* 4: 153–156.
- HOWELL, J. T. 1934. Field days in San Francisco. 1. *Leaflet West. Bot.* 1: 89–91.
- , P. H. RAVEN AND P. RUBTZOFF. 1958. A flora of San Francisco, California. *Wasmann J. of Biol.* 16(1): 1–157.
- LESQUEREUX, L. 1868. Catalogue of Pacific Coast mosses. *Mem. Cal. Acad. Sci.* 1 part 1. San Francisco. 38 pgs.
- MCLINTOCK, E. AND V. MOORE. 1965. Trees of the Panhandle, Golden Gate Park, San Francisco. *Cal. Acad. Sci., Misc. Paper No. 1.* 56 pps. San Francisco.
- SLACK, N. G. 1993. Botanical exploration of California, chapter 10. In: Miller, S.M. (ed.), *John Muir Life and Work.* Univ. New Mexico Press.
- STEERE, W. C., L. E. ANDERSON AND V. S. BRYAN. 1954. Chromosome studies in California mosses. *Mem. Torr. Bot. Club* 20(4) 1–75. [chromosome counts made for two mosses obtained from San Francisco].
- SYED, H. 1973. A taxonomic study of *Bryum capillare* Hedw. and related species. *J. Bryol.* 7(3): 265–326. [cites a historic collection of *Bryum torquescens* obtained from San Francisco].
- THIERS, B.M. AND K.S.G. EMORY. 1992. The history of bryology in California. *The Bryologist* 95: 68–78.
- WATSON, S. 1880. Botany of California. Musci. In: Vol. II. *Geol. Survey of California*, pgs. 353–423. Wiley & Sons, Univ. Press, Cambridge.
- WELCH, W. H. 1960. A monograph of the Fontinalaceae. *Martins Nijhoff.* The Hague. 357 pps. [cites a historic collection of *Fontinalis neomexicana* from San Francisco].
- CATALOGUE OF MOSSES
- Acaulon rufescens* Jaeg. [= *Sphaerangium muticum* (Brandegee 1891 & Lesquereux 1868)]. First record: 1868. On exposed soil. Grounds and fields of meadows, Mission Dolores, *Bolander s.n.* (UC) [confirmed by Toren]. Although habitat for this species still remains in San Francisco, we did not encounter it during this study.
- Alsia californica* (Hook. & Arnott) Sull. First record: 1866. On branches and trunks of both hardwood and conifer trees, especially *Quercus*, *Pitosporum*, *Salix*, *Eucalyptus* and *Cupressus*. Mission Dolores, *Kellogg s.n.* (CAS); The Dell, Lone Mountain, *Kellogg s.n.* (CAS); San Francisco, *Bolander s.n.* (UC); Golden Gate Heights Park, *Toren 7942* (CAS) & *Shevock 19200* (CAS, UC); Glen Canyon, San Miguel Hills, *Shevock 18878 & 18880* (CAS, UC); Golden Gate Park: Botanical Garden, *Hermann 17445* (CAS), near middle lake of Chain of Lakes, *Shevock 19210* (CAS, UC), near Stow Lake, *Shevock 18761 & 18765* (CAS, MO, UC); near Elk Glen Lake, *Shevock 18894* (CAS, MO, UC), Paperback Cross, *Shevock 18804* (CAS, UC); Panhandle, *Toren 7801* (CAS) and near Conservatory of Flowers, *Toren 7747* (CAS) & *Shevock 18802* (CAS, UC); Brotherhood Way near Lake Merced, *Shevock 19286* (CAS, UC); Mt. Sutro, *Shevock 19186* (CAS, UC); Lafayette Park, *Shevock 19249* (CAS, UC).
- Amblystegium juratzkanum* Schimp. First record: 1953. Golden Gate Park, Japanese Tea Garden, *V. S. Bryan 33* (herb. not stated) [specimen cited in Steere, Anderson & Bryan 1954].
- Amblystegium serpens* (Hedw.) Schimp. in B.S.G. First record: 1962. On lawns, base of tree trunks and occasionally concrete retaining walls. Golden Gate Heights Park, *Toren 7946* (CAS); El Polin Loop, Presidio of San Francisco, *Shevock 19230* (CAS, UC); Lafayette Park, *Shevock 19238, 19239 & 19248* (CAS, UC); Jefferson Square, *Shevock 18898* (CAS, UC); Alta Plaza, *Shevock 19255* (CAS, UC); Mission Dolores Park, *Shevock 18989 & 19991* (CAS, UC); Walton Park, *Shevock 19305* (CAS, UC); Embarcadero near Pier 29 & 31, *Shevock 19105* (CAS, MO, UC); Lone Mountain, University of San Francisco, *Shevock 19339* (CAS, UC); Golden Gate Park: *Koch 1635 & 2308* (UC), *Wagner s.n.* (UC), *Norris 97033* (UC); Strybing Botanical Garden, *Hermann 17444* (CAS) & *Shevock 19514* (CAS, UC), Conservatory of Flowers, *Shevock 19307 & 19308* (CAS, UC), Panhandle, *Toren 7800* (CAS), *Shevock 18764* (CAS, UC), *Shevock 18774* (CAS, MO, UC), *Shevock 18933* (CAS, UC), De Laveaga Dell, Aids Memorial Grove, *Shevock 19524* (CAS, UC); Golden Gate National Recreation Area: Fort Mason, *Shevock 19091* (CAS, UC) and Aquatic Park, *Shevock 19096* (CAS, UC); Third at Burke Streets, *Shevock 20204* (CAS, UC).
- Anacolia menziesii* (Turn.) Par. First record: 2000. On soil over rock. Open space (future park) at Castro and 30<sup>th</sup> Streets. *Toren 8020* (CAS).
- Antitrichia californica* Sull. in Lesq. First record: 2000. On concrete retaining wall. Generally found on tree trunks or boulders. Yerba Buena Island, *Shevock 19111* (CAS, UC); Alcatraz Island, Golden Gate National Recreation Area, *Shevock, Toren & Thomas 20210a* (CAS).
- Atrichum undulatum* (Hedw.) P. Beauv. [Lesquereux 1868]. First record: 1868. On exposed mineral soils. Mission Dolores, *Bolander s.n.* (not located at UC). Although habitat exists for this moss in the City especially on Mt. Davidson and Mt. Sutro, we did not encounter it during our study.
- Aulacomnium androgynum* (Hedw.) Schwaegr. First record: 2000. On rotten wood and logs. Golden Gate Park near Strawberry Hill, *Shevock 19161* (CAS, MO, UC) and Chain of Lakes, *Shevock 19207* (CAS, UC); Mt. Sutro, *Toren 7749* (CAS).

- Barbula convoluta* Hedw. [Lesquereux 1868]. First record: 1868. On exposed soil. In gardens, San Francisco, *Bolander s.n.* (UC); Stow Lake, Golden Gate Park, *Koch 2310* (UC); De Laveaga Dell, Aids Memorial Grove, *Shevock 19517* (CAS, UC); along California Academy of Sciences building, *Shevock 18752* (CAS, UC); Twin Peaks, *Eastwood 57* (MO) [det. by Zander] and *Eastwood 59* (CAS) [det. by Bartram]; Mt. Sutro, *Toren 7773* (CAS); Cesar Chavez Street at highway 101, *Toren 7816* (CAS); Below overpass of highway 101 near Pet Cemetery, Presidio of San Francisco, *Shevock 19365* (CAS, UC).
- Barbula unguiculata* Hedw. First record: 2000. On exposed soil. Grand View below Twin Peaks, *Toren 7743* (CAS); Golden Gate Park and 41st Avenue and Lincoln Way, *Toren 8023* (CAS); West Pacific Street near Arguello Gate, Presidio of San Francisco, *Shevock 19360* (CAS, UC).
- Bartramia stricta* Brid. [Lesquereux 1868]. First record: 1868. On over rock. On moist rocks and ground around San Francisco, *Bolander s.n.* (UC); Glen Canyon, San Miguel Hills, *Shevock 18884* (CAS, UC); O'Shaughnessy Blvd., Glen Canyon, *Toren 7812* (CAS).
- Brachythecium asperimum* (C. Müll.) Sull. First record: 1975. On lawns and grassy areas. Mary Ward Hall, San Francisco State University, *Showers 2852* (SFSU) [confirmed by Toren]; Golden Gate Park near Chain of Lakes, *Shevock 19163* (CAS, UC); Mt Sutro, *Shevock 19185* (CAS, UC); Turk and Mason Streets, *J. T. Howell s.n.* (CAS).
- Brachythecium rutabulum* (Hedw.) Schimp. in B. S. G. First record: 2000. On lawns and grassy areas. Near Pet Cemetery below highway 101, Presidio of San Francisco, *Shevock 19367* (CAS, UC) [det. by Norris].
- Brachythecium salebrosum* (Web. & Mohr.) Schimp. in B. S. G. First record: 2000. On soil with seep or wet areas over rock. Cesar Chavez Blvd. At highway 101, *Shevock 19276* (CAS, UC) [det. by Norris].
- Bryolawtonia vancouveriensis* (Kindb. in Mac.) Norris & Enroth First record: 2000. On base of tree trunks or exposed roots. Golden Gate Heights Park, *Toren 7943* (CAS) & *Shevock 19202* (CAS, MO, NY, UC); Golden Gate Park, De Laveaga Dell, Aids Memorial Grove, *Shevock 19521* (CAS, UC).
- Bryum argenteum* Hedw. [Lesquereux 1868]. First record: 1862. On exposed disturbed soils, concrete walls or base of tree trunks. Between Mission Dolores and the sea, *Brewer 898* (CAS, UC); Common around San Francisco, *Bolander s.n.*(UC); near Sutrowood and Stanyan Street, *Eastwood 55* (CAS); near Lake Merced, *Koch 1633* (UC); Jefferson Square, *Shevock 18903* (CAS); Bay View Park west of Candlestick, *Toren 7834* (CAS); Aqua Vista Park, *Shevock 18994* (CAS, MO, UC); Balboa Park, *Shevock 19280* (CAS, UC); Lafayette Park, *Shevock 19237* (CAS, MO, UC); Third and Burke Streets, *Shevock 20205* (CAS, UC).
- Bryum bicolor* Dicks. [= *Bryum californicum* (Brandegee 1891 & Lesquereux 1868), *B. occidentale* (Brandegee 1891) and = *Bryum dichotomum*]. First record: 1868. On soil. Common around San Francisco, on the ground in grassy places, *Bolander s.n.* (UC); sand dunes, *Olson-Seffer s.n.* (UC) [det. by Koch; confirmed by Toren]; Mt. Sutro, *Toren 7774* (CAS); Bay View Park west of Candlestick, *Toren 7832* (CAS); Alta Plaza, *Shevock 19256* (CAS, UC); Lafayette Park, *Shevock 19234* (CAS, UC).
- Bryum canariense* Brid. First record: 2000. On soil, occasionally on rock outcrops or base of tree trunks. Park Blvd., entrance of Fort Winfield Scott, Presidio of San Francisco, *Shevock 19369* (CAS, UC); Golden Gate National Recreation Area: Fort Miley, *Shevock 19372* (CAS, UC) & Fort Funston, *Shevock 19159* (CAS, UC); Cesar Chavez Blvd. At highway 101, *Shevock 19277* (CAS, UC); Twin Peaks, *Shevock 18864* (CAS, UC); Southeast Farallon Island, Farallon National Wildlife Refuge, *Shevock 20147* & *20151* (CAS, UC); Corona Heights, *Shevock 18821* (CAS, UC); Bay View Park, *Shevock 19020* (CAS, UC); Twin Peaks, *Shevock 18869* (CAS, UC); Yerba Buena Island, *Shevock 19117* (CAS, MO, UC); Alamo Square, *Shevock 18906* (CAS, UC).
- Bryum capillare* Hedw. First record: 1868. On soil, rock outcrops or concrete retaining walls. Sandy soils near coast, *Bolander s.n.* (UC); Golden Gate Park, *Wagner 2363* (UC) [det. by Koch; confirmed by Toren]; Alamo Square, *Shevock 18913* (CAS, UC); Paramount Terrace off Stanyan Street, *Toren 7752* (CAS); Douglass Playground, *Toren 7782* (CAS); between Marietta Drive and O'Shaughnessy Blvd., *Toren 7807* (CAS); Bay View Park west of Candlestick, *Toren 7829a* (CAS) & *Shevock 19014* (CAS, UC); Potrero Hill, *Toren 7825* (CAS); Brotherhood Way near Lake Merced Blvd., *Toren 7946b* (CAS); Glen Canyon, San Miguel Hills, *Shevock 18889* (CAS, UC); Bernal Heights Park, *Shevock 19126* (CAS, UC); 14th Avenue and Ortega Street, *Shevock 19144* (CAS, UC); Stern Grove and Pine Lake Park, *Shevock 19158* (CAS, MO, UC); Mt. Sutro, *Shevock 19172* (CAS, UC); Alta Plaza, *Shevock 19259* (CAS, UC); Golden Gate Heights Park, *Shevock 19196* (CAS, UC); Presidio of San Francisco: Fort Point, *Shevock 18941* (CAS, UC) and near Pet Cemetery below highway 101, *Shevock 19222* (CAS, UC); Alcatraz Island, Golden Gate National Recreation Area, *Shevock, Toren & Thomas 20210* (CAS, UC).
- Bryum gemmascens* Kindb. First record: 2000. On soil, rock and gravels. Bernal Heights Park, *Toren 7792* (CAS); Cesar Chavez Blvd. at highway

- 101, *Toren 7818* (CAS); Castro and 30th Streets, *Toren 8017* (CAS); Glen Canyon Park, San Miguel Hills, *Shevock 18887* (CAS, UC); Aqua Vista Park, *Shevock 18995* (CAS, UC); Fort Point, Presidio of San Francisco, *Shevock 18937* (CAS, UC).
- Bryum gemmilucens* Wilcz. & Dem. First record: 2000. On soil and gravels. Aqua Vista Park, *Shevock 18993* (CAS, UC) [det. by Norris].
- Bryum lisae* De Not. First record: 2000. On rocky soils, retaining walls and bricks. Turk and Fillmore Streets, *Shevock 19343* (CAS, UC); Stern Grove and Pine Lake Park, *Shevock 19153* (CAS, UC); Twin Peaks, *Shevock 18870* (CAS, UC); Bay View Park, *Shevock 19011* (CAS, UC); Pacific Street, Presidio of San Francisco, *Shevock 19353* (CAS, UC); Golden Gate National Recreation Area: China Beach, *Shevock 19274* (CAS, UC) and between Painted Rock Cliffs and Sutro Park, *Shevock 18807* (CAS, UC).
- Bryum pseudotriquetrum* (Hedw.) Gaertn., Meyer & Scherb. First record: 2000. On soil. Golden Gate Park between Middle and South Lake of Chain of Lakes west of the Polo Field, *Shevock 19206* (CAS, UC).
- Bryum pyriferum* Crundw. & H. Whiteh. First record: 2000. On rock wall. Alcatraz Island, Golden Gate National Recreation Area, *Toren, Shevock & Thomas 8459* (CAS) [det. confirmed by John Spence]. This collection represents the first documented occurrence of this species for California.
- Bryum torquescens* Bruch First record: 1947. On soil. Golden Gate Park, *Koch s.n.* (MICH) [cited by Syed 1973]; Lone Mountain, University of San Francisco, *Shevock 19334* (CAS, UC) [det. by Norris].
- Calliargonella cuspidata* (Hedw.) Loeske First record: 1969. In lawns and grassy areas. Fort Mason, Golden Gate National Recreation Area, *J. T. Howell s.n.* (CAS); A lawn weed at San Francisco State University, *Showers 450* (SFSU, UC); Mt. Sutro, *Toren 7771* (CAS); McLaren Park, *Shevock 19136* (CAS, MO, UC); Potrero del Sol Park, *Shevock 19278* (CAS, UC); Walton Park, *Shevock 19304* (CAS, UC).
- Campylopus introflexus* (Hedw.) Brid. First record: 2000. On rock outcrops with soil. Mt. Davidson, *Toren 7760* (BONN, CAS) [det. by J-P. Frahm].
- Campylopus pyriformis* (F. Schultz) Bridel First record: 2000. On soil of lawn. Embarcadero at Chestnut Street across from Pier 29 & 31, *Shevock 19102* (BONN, CAS, MO, NY, UC) [det. by J-P. Frahm]. This collection represents the first documented occurrence of this species for California.
- Campylopus subulatus* Schimp. in Rabenh. First record: 2000. Base of tree trunks and on clayey soils. Panhandle, Golden Gate Park, *Shevock 18769* (BONN, CAS, MO, UC) & *18772* (BONN, CAS, NY, UC); Mt. Davidson, *Shevock 19291* (BONN, CAS, MO, UC) [dets. by J-P. Frahm].
- Ceratodon purpureus* (Hedw.) Brid. First record: 1868. On soils and gravels, rock outcrops and occasionally at base of tree trunks. Mission Dolores, *Bolander s.n.* (UC); Sutrowood and Stanyan Street, *Eastwood 57* (CAS); Tank Hill, *Shevock 18919* (CAS, MO, UC); Twin Peaks, *Shevock 18862 & 19142* (CAS, UC), *Toren 7745* (CAS) and *Raven 21* (CAS); between Marietta Drive and O'Shaughnessy Blvd., *Toren 7813* (CAS); Bay View Park, *Shevock 19009* (CAS, MO, UC); Mt. Davidson, *Shevock 19289* (CAS, UC); Mt. Sutro, *Shevock 19194* (CAS, UC) & *19183* (CAS, UC); 14th Avenue at Ortega Street, *Shevock 19148* (CAS, UC); Golden Gate Heights Park, *Shevock 19203* (CAS, UC); Corona Heights Park, *Shevock 18824* (CAS, UC); Embarcadero near Piers 29 & 31, *Shevock 19104* (CAS, UC); McLaren Park, *Shevock 19135* (CAS, MO, UC); Coastal Bluff Trail, Golden Gate National Recreation Area, *Shevock 18805* (CAS, UC) & *18810* (CAS, MO, UC); Walton Park, Financial District, *Shevock 19301* (CAS, UC); Stanyan & Fulton Streets, Golden Gate Park, *Shevock 18837* (CAS, UC); Cesar Chavez Blvd. At highway 101, *Toren 7821* (CAS).
- Chenia leptophylla* (C. Müll.) Zand. First record: 1977. On exposed soils. Golden Gate Park near 41st Avenue and Lincoln Blvd., *Toren 2921* (CAS, SFSU).
- Claopodium whippleanum* (Sull. in Whipple & Ives) Ren. & Card. First record: 2000. On exposed soils and rock underhangs. Mt. Sutro, *Shevock 19167* (CAS, MO, UC) & *Shevock 19179a* (CAS, UC); Mt. Davidson, *Shevock 19289* (CAS, MO, UC) & *19297* (CAS, UC).
- Crumia latifolia* (Kindb. in Mac.) Schof. First record: 2000. On calcareous seeps. Coastal Bluff Trail, Golden Gate National Recreation Area, *Shevock 18815* (CAS, UC); Sutro Bath Site, Golden Gate National Recreation Area, *Shevock 19214* (CAS, UC).
- Dicranella heteromalla* (Hedw.) Schimp. First record: 2000. On clayey soils and crevices of rock outcrops. Mt. Davidson, *Shevock 18928* (CAS, MO, UC), *Shevock 19288* (CAS, UC), *19292* (CAS, MO, UC) and *Toren 7765* (CAS); Mt. Sutro, *Shevock 19171* (CAS, UC); Yerba Buena Island, *Toren 8054* (CAS); Fort Point, Presidio of San Francisco, *Shevock 18936* (CAS, UC); Southeast Farallon Island, Farallon National Wildlife Refuge, *Shevock 20148* (CAS, UC).
- Dicranella howei* Ren. & Card. First record: 1868. On clayey soils. Bay of San Francisco, *Bolander s.n.* (UC) [det. by Toren]; Coastal Bluff Trail, Golden Gate National Recreation Area, *Shevock 18806* (CAS, MO, UC); McLaren Park, *Shevock 19138* (CAS, UC).
- Dicranella varia* (Hedw.) Schimp. First record:



2000. On clayey soils. Bay View Park west of Candlestick, *Toren* 7839 (CAS).
- Dicranoweisia cirrata* (Hedw.) Lindb. ex Milde  
First record: 1954. On tree trunks, exposed roots and rock outcrops. Mt. Davidson, *Toren* 7770 (CAS); Golden Gate Heights Park, *Toren* 7941 (CAS); 14th Avenue and Ortega Street, *Shevock* 19149 (CAS, UC); Lincoln Park, Golden Gate National Recreation Area, *Shevock* 19268 (CAS, MO, UC); Mt. Sutro, *Shevock* 19180 (CAS, UC); Presidio of San Francisco, *Shevock* 19355 (CAS, UC); Panhandle section of Golden Gate Park, *Shevock* 20287 (CAS, UC) and horseshoe court near Stanyan and Fulton Sts., *Raven s.n.* (CAS) [det. by MacFadden; confirmed by Toren].
- Dicranum fuscescens* Turn. First record: 2000. On tree trunks. Mt. Sutro, *Shevock* 19192 (CAS, UC).
- Dicranum howellii* Ren. & Card. First record: 2000. On soil and leaf litter. Mt. Davidson, *Shevock* 19290 (CAS, MO, NY, UC) and *Toren* 7767 (CAS).
- Didymodon australasiae* (Grev. & Hook.) Zand. First record: 2000. On concrete wall of buildings. Golden Gate Park, South Windmill, *Shevock* 18896 (BUF, CAS, UC) [confirmed by Zander].
- Didymodon insulanus* (De Not.) M. Hill First record: 2000. On sandy soils. 14th Avenue and Ortega Street, *Shevock* 19145 (CAS, UC) [det. by Norris].
- Didymodon nicholsonii* Culm. First record: 2000. On cement brick wall. Golden Gate Park at Willard North and Fulton Streets, *Shevock* 18833 (CAS, UC) [det. by Norris].
- Didymodon rigidulus* Hedw. First record: 2000. On asphalt walkways. Golden Gate Park, De Laveaga Dell, Aids Memorial Grove, *Shevock* 19515 & 20283 (CAS, UC).
- Didymodon tophaceus* (Brid.) Lisa [= *Trichostomum tophaceum* (Lesquereux 1868)]. First record: 1868. On wet soils and seeps generally with some salts. Fort Point (base of the Golden Gate Bridge), Presidio of San Francisco: *Bolander s.n.* (UC) & *Howe* 55 (UC), *Shevock* 18816 & 18934 (CAS, UC), *Toren* 7742 (CAS), Baker Beach, *Shevock* 18950 & 19152 (CAS, UC) and El Polin Spring, *Shevock* 19231 (CAS, UC); Bay View Park west of Candlestick, *Toren* 7841 (CAS) and *Shevock* 19007 (CAS, MO, NY, UC); McLaren Park, *Shevock* 19137 (CAS, UC); Lake Merced, *Raven* 3 (CAS); Sutro Baths site, Golden Gate National Recreation Area, *Shevock* 19211 & 19213 (CAS, UC), China Beach, *Shevock* 19271 & 19272 (CAS, UC) and Lands End, *Eastwood s.n.* (CAS) [det. by Koch; confirmed by Toren]; Stow Lake, Golden Gate Park, *Shevock* 18756 (CAS, UC).
- Didymodon umbrosus* (C. Müll.) Zand. First record: 2000. On compacted soils over concrete or asphalt. Aqua Vista Park, Central Basin, *Shevock* 18997 (BUF, CAS, MO, UC) [det. by Zander] & *Shevock* 18992 (CAS, UC).
- Didymodon vinealis* (Brid.) Zand. [= *Barbula cylindrica*, *B. flexifolia*, *B. subfallax*, *B. vinealis* & *B. virescens* (Brandege 1891 & Lesquereux 1868)]. First record: 1868. On soil, rock outcrops, concrete retaining walls and buildings. Presidio of San Francisco: Fort Point, *Bolander s.n.* (UC) & *Shevock* 18938 (CAS, UC), Baker Beach, *Shevock* 18951 (CAS), *Shevock* 18946 & 18947 (CAS, UC), near Pet Cemetery below highway 101, *Shevock* 19223 (CAS, UC) and Julius Kahn Playground near Locust Street, *Shevock* 19351 (CAS, UC); Mission Dolores, *Howe* 501 (CAS) and *Shevock* 20282 (CAS, UC); Franklin and Pacific Streets, *Raven s.n.* (CAS); Turk & Fillmore Streets, *Shevock* 19341 (CAS, UC); Mt. Davidson, *Shevock* 19296 (CAS, UC); Mt. Sutro, *Shevock* 19188 (CAS, UC); Buena Vista Park, *Shevock* 18914 (CAS, MO, UC); Potrero Hill, *Toren* 7826 (CAS), *Shevock* 19001 & 19004 (CAS, UC); Twin Peaks, *Shevock* 18865 (CAS, UC); Douglass Playground, *Toren* 7781 (CAS); Bernal Heights Park, *Toren* 7788 (CAS) and *Shevock* 19127 (CAS, UC); Bay View Park west of Candlestick, *Toren* 7838 (CAS); open space at 30th and Castro Street, *Shevock* 19346 (CAS, UC); Yerba Buena Island, *Shevock* 19115, 19118 & 20248 (CAS, UC); Kite Hill Park, *Shevock* 19140 (CAS, UC); Stern Grove and Pine Lake Park, *Shevock* 19150 & 19155 (CAS, UC); Golden Gate Heights Park, *Shevock* 19197 (CAS, UC); Near Stanyan and Fulton Streets, *Raven s.n.* (CAS); Golden Gate Park: Lily Lake, *Shevock* 18820 (CAS, UC); Mallard Lake, *Oberlander s.n.* (SFSU) [det. by Toren]; De Laveaga Dell, Aids Memorial Grove, *Shevock* 19525 (CAS, UC), California Academy of Sciences building, *Shevock* 18751 (CAS, UC); Golden Gate National Recreation Area: Fort Miley, USS San Francisco Memorial, *Shevock* 19370 (CAS, UC); Lincoln Park, *Shevock* 19265 & 19269 (CAS, UC), Fort Mason, *Shevock* 19093 (CAS, UC); Alcatraz Island, Golden Gate National Recreation Area, *Steen s.n.* (UC), *Toren* 8469 (CAS) and *Shevock*, *Toren* & *Thomas* 20211 & 20215 (CAS, UC).
- Ditrichum ambiguum* Best First record: 2000. On soil over rock. Mt. Davidson, *Toren* 7805 (CAS).
- Ditrichum schimperi* (Lesq.) Kuntze First record: 2000. On soil over rock. Mt. Sutro, *Toren* 7748 (CAS); Corona Heights, *Shevock* 18882 (CAS, UC); Mt. Davidson, *Shevock* 18926 & 19299 (CAS, UC); Glen Canyon, San Miguel Hills, *Shevock* 18890 (CAS, MO, UC); Corona Heights, *Shevock* 18822 (CAS, MO, UC); Yerba Buena Island, *Toren* 8057 (CAS).
- Drepanocladus aduncus* (Hedw.) Warnst. [= *Hypnum aduncum* (Brandege 1891 & Lesquereux 1868)]. First record: 1868. On wet lawns and saturated soils. Swamps near San Francisco, *Bolan-*

- der s.n.* (UC); Stonestown off of 19th Avenue, *Toren 8061* (CAS); Diamond Heights, 28th and Douglass Streets, *Toren 8458* (CAS).
- Entosthodon bolanderi* Lesq. [Lesquereux (1868)] First record: 1868. On soil. Clayey soil banks of the bay of San Francisco, *Bolander s.n.* (UC). Although habitat for this species still remains in San Francisco, we did not encounter this ephemeral species during our study.
- Ephemerum serratum* (Hedw.) Hampe [Lesquereux (1868)]. First record: 1868. On exposed soil. On the grounds and fields of meadows, Mission Dolores, *Bolander s.n.* (DUKE, UC) [confirmed by Toren]. Although habitat for this species still remains in San Francisco, we did not encounter this ephemeral species during our study.
- Epipterygium tozeri* (Grev.) Lindb. [= *Webera tozeri* (Brandege 1891); *Bryum tozeri* (Lesquereux 1868)]. First record: 1868. On shaded clayey soils and rock underhangs. Borders of roads and ditches, San Francisco, *Bolander s.n.* (UC); Corona Heights, *Shevock 18831* (CAS, MO, UC); Golden Gate Park, *Shevock 18836* (CAS, MO, UC); between Marietta Drive and O'Shaughnessy Blvd., *Toren 7811* (CAS); Douglass Playground, *Toren 7757* (CAS); Yerba Buena Island, *Shevock 19124* (CAS, MO, UC); Bernal Heights Park, *Shevock 19131* (CAS, UC); Fort Mason, Golden Gate National Recreation Area, *Shevock 19094* (CAS, MO, UC); Arguello at Washington Blvd., Presidio of San Francisco, *Shevock 19228* (CAS, MO, UC); Mt. Davidson, *Shevock 19298* (CAS, UC); Mt. Sutro, *Shevock 19178* (CAS, MO, UC); Alcatraz Island, Golden Gate National Recreation Area, *Toren 8468* (CAS).
- Eurhynchium hians* (Hedw.) Sande Lac. First record: 2000. On damp soil with leaf litter. Lone Mountain, *Shevock 19337* (CAS, UC) [det. by Norris].
- Fissidens bryoides* Hedw. var. *longifolius* (Brid.) Hampe [= *F. bryoides* var. *viridulus* (Swartz) Brotherus]. First record: 1962. On shaded clayey soils. Golden Gate Park, De Laveaga Dell, Aids Memorial Grove, *Hermann 17449* (CAS) [det. by Pursell]
- Fissidens crispus* Mont. [= *Fissidens limbatus* Sull. (Brandege 1891 & Lesquereux 1868)]. First record: 1868. On shaded clayey soils. Common around San Francisco, *Bolander s.n.* (UC) [det. confirmed by Pursell]; Golden Gate Park near Conservatory of Flowers, *Toren 7746* (CAS) and *Raven 13* (CAS) [confirmed by Pursell]; Presidio of San Francisco: Coastal Bluff Trail, *Shevock 18943* (CAS, PAC, UC) and Arguello Blvd. at Washington Blvd., *Shevock 19227* (CAS, PAC, UC) [dets. by Pursell]; Golden Gate National Recreation Area: Coastal Bluff Trail near Sutro Park, *Shevock 18814* (CAS, PAC, UC) and Lincoln Park near Palace of the Legion of Honor, *Shevock 19263* (CAS, PAC, UC) [dets. by Pursell]; Glen Canyon, *Shevock 18873* (CAS, PAC, UC) [det. by Pursell]; Bay View Park, *Shevock 19018* (CAS, PAC, UC) [det. by Pursell]; Mt. Sutro, *Shevock 19173 & 19175* (CAS, PAC, UC) [det. by Pursell]; Stern Grove, *Shevock 19156* (CAS, PAC, UC) [det. by Pursell]; Mt. Davidson, *Toren 7761* (CAS); Lone Mountain, *Shevock 19332* (CAS, MO, PAC, UC) [det. by Pursell]; Castro at 30th Street, *Shevock 19349* (CAS, PAC, UC) [det. by Pursell].
- Fissidens curvatus* Horsch. [= *Fissidens milobakeri* Koch]. First record: 2000. On clayey soils. Coastal Bluff Trail, Golden Gate National Recreation Area, *Shevock 18809* (CAS, MO, PAC, UC) [confirmed by Pursell]; along O'Shaughnessy Blvd. adjacent to west edge of Glen Canyon, *Shevock 18886* (CAS, PAC, UC) [confirmed by Pursell]; Buena Vista Park, *Shevock 18915* (CAS, PAC, UC) [confirmed by Pursell]; Douglass Playground, *Toren 7758* (CAS); Mt. Sutro, *Toren 7772* (CAS); Bernal Heights Park, *Toren 7793* (CAS); Yerba Buena Island, *Shevock 19125* (CAS, PAC, UC) & *Toren 8052* (CAS) [confirmed by Pursell]; Corona Heights, *Shevock 18830* (CAS, PAC, UC) [det. by Pursell]; Twin Peaks, *Shevock 18863 & 18872* (CAS, PAC, UC) [confirmed by Pursell].
- Fissidens cf. minutulus* Sullivant First record: 2000. Golden Gate Park, De Laveaga Dell, Aids Memorial Grove, *Shevock 20284* (CAS, PAC, UC) [det. by Pursell]
- Fissidens sublimbatus* Grout First record: 2000. On shaded clayey soils. Coastal Bluff Trail, Presidio of San Francisco, *Shevock 18945* (CAS, PAC, UC); Bay View Park, *Toren 7831* (CAS); Potrero Hill, *Toren 7824* (CAS) [dets. by Pursell]; Yerba Buena Island, *Shevock 20251* (CAS, PAC, UC) [det. by Pursell].
- Fontinalis neomexicana* Sull. & Lesq. First record: 1875. Attached to rocks in creek. *Vasey s.n.* (US) [cited by Welch 1960]. This species is likely extirpated from San Francisco due to lack of suitable habitat.
- Funaria hygrometrica* Hedw. First record: 1949. On moist or dry soils, retaining walls and other disturbed areas. Common on disturbed soils throughout the City. Golden Gate Park: California Academy Building, *Shevock 18753* (CAS, UC), Quarry Lake, *Raven 7* (CAS); Civic Center, *J. T. Howell s.n.* (CAS); Fillmore at Vallejo Street, *Raven s.n.* (CAS); Webster at Fillmore Street, *Raven s.n.* (CAS); east end of 22nd Avenue, *J. T. Howell s.n.* (CAS); above Lake Merced, *Raven 4* (CAS); Baker Beach, Golden Gate Recreation Area, *Raven s.n.* (CAS); Aqua Vista Park, *Shevock 18996* (CAS, UC); Bay View Park, *Shevock 19015* (CAS, UC); Corona Heights, *Shevock 18827* (CAS, UC); Yerba Buena Island, *Shevock 19123* (CAS, MO, UC); Embarcadero across from Pier 29 & 31, *Shevock 19103* (CAS, UC); Aqua Vista Park, *Shevock*

- 18996 (CAS, UC); Golden Gate Heights Park, *Shevock 19195* (CAS, UC); Lake Merced, *Shevock 19287* (CAS, UC); Sutro Bath site, *Shevock 19216* (CAS, UC) and Fort Funston, Golden Gate National Recreation Area, *Shevock 19160* (CAS, UC); Lone Mountain, *Shevock 19338* (CAS, UC); Corona Heights above the Castro, *Shevock 18829* (CAS, UC); Alcatraz Island, Golden Gate National Recreation Area, *Toren 8467* (CAS).
- Funaria muhlenbergii* Turn. [= *Funaria mediterranea* (Brandegee 1891); *Funaria calcarea* (Lesquereux 1868)]. First record: 1868. On soil. Mission Dolores, *Bolander s.n.* (UC). Although habitat for this species still remains in San Francisco, we did not encounter this ephemeral species during our study.
- Grimmia laevigata* (Brid.) Brid. First record: 2000. On boulders and rock outcrops. Entrance to Hall of Man, California Academy of Sciences, Golden Gate Park, *Toren 7822* (CAS).
- Grimmia lissae* De Not. First record: 2000. On boulders, rock outcrops and concrete retaining walls. Twin Peaks, *Toren 7753* (CAS); Yerba Buena Island, *Toren 8056* (CAS) & *Shevock 19109* (CAS, MA, UC) [det. by Muñoz].
- Grimmia montana* Bruch & Schimp. in B.S.G. [Brandegee (1891); Lesquereux (1868)]. First record: 1868. On boulders and rock outcrops. San Francisco, *Bolander s.n.* (UC). Although habitat exists for the species in San Francisco, we did not encounter it during our study.
- Grimmia pulvinata* (Hedw.) Sm. First record: 2000. On boulders, rock outcrops and concrete retaining walls. Alamo Square, *Shevock 18912* (CAS); Clipper Street near Douglass Playground, *Toren 7779* (CAS); Bay View Park west of Candlestick, *Toren 7833* (CAS); Yerba Buena Island, *Shevock 19113* (CAS, MA, UC) [det. by Muñoz].
- Grimmia trichophylla* Grev. [= *Grimmia californica* (Brandegee 1891 & Lesquereux 1868) & *G. watsoni* (Brandegee 1891)]. First record: 1868. On boulders, rock outcrops and concrete retaining walls. Common around San Francisco, *Bolander s.n.* (UC); Golden Gate Heights Park, *Toren 7940* (CAS); Twin Peaks, *Shevock 18871* (CAS, UC) and *Toren 7744* (CAS); Mt. Sutro, *Shevock 19174* (CAS, UC); Glen Canyon, San Miguel Hills, *Shevock 18883* (CAS, MO, UC); Mt. Davidson, *Toren 7769* (CAS); Yerba Buena Island, *Shevock 19116* (CAS, UC); open space (Future park), corner of Castro and 30th Streets, *Toren 8015* (CAS); 14th & Ortega Streets, *Shevock 19147* (CAS, MA, UC) [det. by Muñoz].
- Gymnostomum aeruginosum* Sm. [= *Gymnostomum calcareum* var. *perpusillum* (Brandegee 1891 & Lesquereux 1868)]. First record: 1868. On shaded, moist calcareous soil over rock. San Francisco, *Bolander s.n.* (UC); Cesar Chavez Street at highway 101, *Toren 7817* (CAS).
- Hennediella heimii* (Hedw.) Zand. First record: 2000. On exposed soil. Letterman Complex, Presidio of San Francisco, *Shevock 20207* (CAS, UC).
- Hennediella stanfordensis* (Steere) Blockeel First record: 2000. On exposed soil. Potrero Hill, *Toren 7827* (CAS); Cesar Chavez Street at highway 101, *Toren 7815* (CAS); Golden Gate Park, *Toren s.n.* (CAS, SFSU); Wayland and University Streets near McLaren Park, *Toren 7743b* (CAS); Bernal Heights Park, *Toren 7784* (CAS); Aqua Vista Park, Central Basin, *Shevock 18999* (CAS, UC), McKinley Square, *Shevock 19275* (CAS, UC); southeast end of Lake Merced. *Shevock 20286* (CAS, UC).
- Heterocladium dimorphum* (Brid.) Schimp. in B. S. G. First record: 2000. On tree trunks. Lafayette Park, *Shevock 19242* (CAS, NY, UC) & *19245* (CAS, MO, UC); Balboa Park, *Shevock 19279* (CAS, UC) [dets. by Norris]. These collections represent the first documented occurrences of this species for California.
- Homalothecium arenarium* (Lesq.) Lawt. [= *Hypnum arenarium* (Brandegee 1891 & Lesquereux 1868)]. First record: 1868. On soil, leaf litter and rock outcrops. Covering the sand among bushes near the shore, *Bolander s.n.* (UC); Twin Peaks, *Shevock 18868* (CAS, UC) and *Toren 7755* (CAS); Bay View Park, *Shevock 19013* (CAS, MO, UC); Bernal Heights Park, *Toren 7791* (CAS) & *Shevock 19130* (CAS, MO, UC); open space (future park) at Castro and 30th Streets, *Toren 8018* (CAS); Douglass Playground, *Toren 7776* (CAS); Kite Hill Park, *Shevock 19141* (CAS, UC); Baker Beach, Presidio of San Francisco, *Shevock 18948* (CAS, MO, UC).
- Homalothecium nuttallii* (Wils.) Jaeg. First record: 2000. On bases of tree trunks, rock outcrops and concrete and brick-like retaining walls. Buena Vista Park, *Shevock 18916* (CAS, UC); Bernal Heights Park, *Toren 7786* (CAS); Paramount Terrace off Stanyan Street, *Toren 7751* (CAS); Golden Gate Park, Panhandle, *Toren 7802* (CAS) & *Shevock 18768* (CAS, MO, UC); Yerba Buena Island, *Toren 8058* (CAS) & *Shevock 19119* (CAS, MO, UC); Mt. Sutro, *Shevock 19182* (CAS, MO, UC); near Crissy Field, Presidio of San Francisco, *Shevock 19224* (CAS, MO, NY, UC); Julius Kahn Playground, Presidio of San Francisco, *Shevock 19350* (CAS, MO, UC); Aquatic Park, Golden Gate National Recreation Area, *Shevock 19097* (CAS, MO, NY, UC); Alta Plaza Park, *Shevock 19262* (CAS, UC); Bay View Park, *Shevock 19019* (CAS, MO, NY, UC).
- Hygroamblystegium tenax* (Hedw.) Jenn. [= *Hygroamblystegium irriguum* in Steere, Anderson & Bryan 1954] First record: 1953. Golden Gate Park, Japanese Tea Garden, *L.E. Anderson 32* (herb. not cited) [specimen cited in Steere, Anderson & Bryan 1954].
- Isothecium cristatum* (Hampe) Robins. [= *Hypnum brewerianum* (Brandegee 1891 & Lesquereux

1868)]. First record: 1868. On exposed roots, logs and base of tree trunks, gravelly soils and rock outcrops and concrete retaining walls. On metamorphic sandstone around San Francisco, *Bolander s.n.* (UC); Glen Canyon, San Miguel Hills, *Shevock 18875 & 18891* (CAS, MO, UC); Corona Heights, *Shevock 18825* (CAS, UC); Mt. Sutro, *Shevock 19177* (CAS, UC), *Shevock 19169* (CAS, MO, UC) & *19187* (CAS, UC); open space (future park) corner of Castro and 30th Streets, *Toren 8021* (CAS) & *Shevock 19345* (CAS, UC); North Lake of Chain of Lakes, Golden Gate Park, *Shevock 19205* (CAS, UC); Presidio of San Francisco: Pacific Street near playground, *Shevock 19354 & 19357* (CAS, UC) and Presidio Golf Course, *Shevock 19363* (CAS, UC); Yerba Buena Island, *Shevock 20246 & 20249* (CAS, UC); Mt. Davidson, *Shevock 19293* (CAS, UC); between Painted Rock Cliffs and Sutro Park, Golden Gate National Recreation Area, *Shevock 18811* (CAS, MO, UC) [dets. by Norris].

*Isoetecium myosuroides* Brid. [= *Hypnum myosuroides* (Brandege 1891 & Lesquereux 1868)]. First record: 1868. On tree trunks, logs and rock outcrops. In dry woods, San Francisco, *Bolander s.n.* (UC); Mt. Davidson, *Shevock 18924 & 18927* (CAS, MO, UC) and *Toren 7766* (CAS); Mt. Sutro, *Shevock 19170, 19176, 19190, & 19193* (CAS, UC); Golden Gate Heights Park, *Toren 7945* (CAS); Brotherhood Way near Lake Merced, *Shevock 19285* (CAS, MO, UC); southeast side of Lake Merced, *Shevock 20285* (CAS, UC); Golden Gate National Recreation Area: Lincoln Park, Palace of the Legion of Honor, *Shevock 19264* (CAS, UC) and Coastal Bluff Trail between Painted Rock Cliffs and Sutro Park, *Shevock 18812* (CAS, UC) and Alcatraz Island, *Shevock, Toren & Thomas 20209* (CAS, UC).

*Isoetecium spiculiferum* (Mitt.) Ren. & Card. First record: 2000. On tree logs. Mt. Sutro, *Shevock 19181* (CAS, UC); Golden Gate Park, Chain of Lakes, *Shevock 19204* (CAS, UC) [dets. by Norris].

*Kindbergia oregana* (Sull.) Ochyra [= *Eurhynchium oreganum* (Sull.) Jaeg.] First record: 2000. On soil with leaf litter and logs. Mt. Davidson, *Shevock 18923* (CAS); Mt. Sutro, *Shevock 19184* (CAS, MO, UC); Fort Point, Presidio of San Francisco, *Shevock 18939* (CAS, MO, UC); Lone Mountain, *Shevock 19336* (CAS, MO, NY, UC); Glen Canyon, San Miguel Hills, *Shevock 18877* (CAS, UC); Yerba Buena Island, *Shevock 20247* (CAS, UC).

*Kindbergia praelonga* (Hedw.) Ochyra [= *Eurhynchium praelongum* (Hedw.) Schimp. in B.S.G.]. First record: 1923. On soil with leaf litter, lawns, rock outcrops and tree trunks. Mt. Davidson, *Shevock 18925* (CAS, MO, UC), *Shevock 19294* (CAS, MO, UC), *Shevock 19295* (CAS, UC) & *Oberlander s.n.* (SFSU); Lone Mountain, *Shev-*

*ock 19333* (CAS, MO, UC); Brotherhood Way near Lake Merced Blvd., *Toren 4946d* (CAS); Walton Park, *Shevock 19302* (CAS, UC); Lafayette Park, *Shevock 19243* (CAS, UC); Alamo Square, *Shevock 18907* (CAS, UC); Alta Plaza, *Shevock 19253* (CAS, UC); Golden Gate Heights Park, *Shevock 19199* (CAS, UC); Corona Heights, *Shevock 18828* (CAS, UC); Stern Grove and Pine Lake Park, *Shevock 19154 & 19157* (CAS, UC); McLaren Park, *Shevock 19134* (CAS, UC); Mt. Sutro, *Shevock 19168* (CAS, UC); Burke at Third Street, *Shevock 19006* (CAS, UC); Golden Gate Park: *Koch 1636* (UC), *Wagner 2365* (UC), *Koch 1636* (UC); Lily Lake, *Shevock 18817* (CAS, UC) & *Shevock 18818* (CAS, MO, UC), Mallard Lake, *Shevock 18893* (CAS, MO, UC), between Stow Lake and De-Young Museum, *Shevock 18759* (CAS, MO, UC), Quarry Lake, *Raven 8 & Hermann 17448* (CAS), Rhododendron Grove, *Shevock 18762* (CAS, UC), Redwood Grove, Fulton Street near 12th Avenue, *Raven s.n.* (CAS), Conservatory of Flowers, *Shevock 18819* (CAS, UC), Panhandle, *Shevock 18770* (CAS, UC); hill near Cole Street, *Eastwood 58* (CAS), De Laveaga Dell, Aids Memorial Grove, Golden Gate Park, *Shevock 19516, 19518, & 19523* (CAS, UC), California Academy of Sciences, *Shevock 18754* (CAS, UC), Middle Chain of Lakes, *Shevock 19208* (CAS, UC), Strawberry Hill, *Shevock 19162, 19164, & 19166* (CAS, UC); Presidio of San Francisco: near Crissy Field, *Shevock 19226* (CAS, UC) & Fort Point, *Shevock 18935* (CAS, MO, UC), near Arguello Gate, *Shevock 19359* (CAS, UC), Letterman Complex, *Shevock 19217, 19218, & 19220* (CAS, UC), Pacific Street near playground, *Shevock 19358* (CAS, UC); Golden Gate National Recreation Area: Fort Mason, *Shevock 19092* (CAS, UC), Lincoln Park, *Shevock 19266* (CAS, UC).

*Leptobryum pyriforme* (Hedw.) Brid. First record: 1867. On soil of seepy areas. The Dell, Lone Mountain, *Kellogg s.n.* (CAS); Ewing Terrace, *Toren 7783* (CAS); Bay View Park, *Shevock 19016* (CAS, UC); Presidio of San Francisco near Arguello Gate, *Shevock 19361* (CAS, MO, UC) and just west of Pet Cemetery, *Shevock 19225 & 19366* (CAS, MO, UC).

*Leptodictyum riparium* (Hedw.) Warnst. First record: 2000. On saturated soils and lawns. Alamo Square, *Shevock 18909* (CAS, MO, UC); Embarcadero near Pier 29 & 31, *Shevock 19107* (CAS, UC).

*Microbryum starkeanum* (Hedw.) Zand. [= *Pottia starkeanum* (Brandege 1891) & as *Anacalypta starkeana* (Lesquereux 1868)] First record: 1868. On bare soil. Mission Dolores, *Bolander s.n.* (UC); Golden Gate Park near 41st Avenue and Lincoln Blvd., *Toren 8022* (CAS).

*Orthodicranum tauricum* (Sapelin) Smirnova First

- record: 2000. On rotten logs. Mt. Sutro, *Shevock 19191* (CAS, UC).
- Orthotrichum consimile* Mitten First record: 2000. On *Pittosporum* and *Myoporum* tree trunks. Diamond Heights, Duncan Street and Cameo Way, *Toren 8160* (CAS); Panhandle, Golden Gate Park, *Shevock 18932* (CAS, UC) [det. by Norris].
- Orthotrichum diaphanum* Brid. First record: 2000. On tree trunks and concrete retaining walls. Golden Gate Park, Panhandle, *Toren 7795* (CAS) & *Shevock 18931* (CAS, MO, UC); Balboa Park, *Shevock 19283* (CAS, UC); Lafayette Park, *Shevock 19240* (CAS, MO, UC).
- Orthotrichum lyellii* Hook. & Tayl. First record: 2000. On tree trunks and branches. Golden Gate Park, Panhandle, *Shevock 18838* & *18932a* (CAS, UC) and De Laveaga Dell, Aids Memorial Grove, *Shevock 19519* (CAS, UC); Mt. Sutro, *Shevock 19300* (CAS, UC); Alamo Square, *Shevock 18905* (CAS, UC); Glen Canyon, San Miguel Hills, *Shevock 18881* (CAS, UC); Lafayette Park, *Shevock 19242* (CAS, UC); Embarcadero near Piers 29 & 31, *Shevock 19106* (CAS, UC); Letterman Hospital Complex, Presidio of San Francisco, *Shevock 19219* (CAS, UC) [det. by Vitt]; Third Street between Burke and Custer Streets, *Shevock 19005* & *20203* (CAS, UC) [det. by Vitt].
- Orthotrichum rivulare* Turn. First record: 1868? On rocks along stream. San Francisco, *Bolander s.n.* no date (UC). Although this Bolander collection attributed to San Francisco was not referenced by Brandegee (1891), the specimen is nonetheless accurately identified [det. confirmed by Norris]. This species is most likely extirpated from San Francisco with the elimination of free-flowing streams with bedrock.
- Orthotrichum tenellum* Bruch ex Brid. First record: 2000. On tree trunks and rock outcrops and concrete retaining walls. Panhandle of Golden Gate Park, *Toren 7794* (CAS), *Shevock 18763* & *Shevock 18930* (CAS, UC); Yerba Buena Island, *Toren 8051* (CAS); Lafayette Park, *Shevock 19242* (CAS, UC); Jefferson Square, *Shevock 18902* (CAS, UC); Pershing Square, Presidio of San Francisco, *Shevock 19368* (CAS, UC); Holly Park, *Shevock 19132* (CAS, UC); Third and Burke Streets, *Shevock 20202* (CAS, UC); Southeast Farallon Island, Farallon National Wildlife Refuge, *Shevock 20149* (CAS, UC).
- Phascum cuspidatum* Hedw. [Brandegee (1891) & Lesquereux (1868)] First record: 1868. On exposed soil. On the grounds and fields and meadows, Mission Dolores, *Bolander s.n.*(UC) [confirmed by Toren]; Potrero Hill, *Toren 7823* (CAS).
- Philonotis capillaris* Lindb. in Hartm. First record: 2000. On moist soil over rock. Tank Hill, *Shevock 18918* (CAS, UC); Clipper Street near Douglass Playground, *Toren 7780* (CAS); Bernal Heights Park, *Toren 7790* (CAS).
- Plagiothecium laetum* Schimp. in B.S.G. First record: 2000. On logs and on moist soil with rock. Near Stow Lake, Golden Gate Park, *Shevock 18760* (CAS, MO, UC) & *19165* (CAS, MO, NY, UC) and near Chain of Lakes, *Shevock 19161a* (CAS); Mt. Davidson, *Toren 7763* (CAS).
- Pleuridium acuminatum* [= *Pleuridium bolanderi* C. Muell ex Jaeg.]. First record: 1868. On exposed soil. Near San Francisco, *Bolander s.n.*(UC); Mt. Davidson, *Shevock 18921* (CAS); Marietta Drive, *Toren 7810* (CAS); on hill near Sutrowood and Stanyan Street, *Eastwood 54* (CAS); Wayland at University Street near McLaren Park, *Toren 7743c* (CAS); Bernal Heights Park, *Toren 7787* (CAS); open space (future park) at corner of Castro and 30th Streets, *Toren 8016* (CAS); Diamond Heights, *Toren 8457* (CAS).
- Pleuridium subulatum* (Hedw.) Rabenh. First record: 1904. On exposed soil. Glen Canyon, San Miguel Hills, *Shevock 18888* (CAS, UC); Arguello Blvd. At Washington Blvd., Presidio of San Francisco, *Shevock 19229* (CAS, UC); Golden Gate Park, *Gardner s.n.* (UC) [dets. by Norris].
- Pohlia nutans* (Hedw.) Lindb. First record: 2000. On moist soils with rock. Mt. Davidson, *Toren 7762* (CAS).
- Pohlia wahlenbergii* (Web. & Mohr.) Andrews [= *Bryum albicans* (Brandegee 1891 & Lesquereux 1868)]. First record: 1868. On moist soil. On rocks watered by springs, *Bolander s.n.*, (UC) [det. confirmed by Shaw]. This species is likely extirpated from San Francisco due to a lack of suitable habitat.
- Polytrichastrum alpinum* (Hedw.) G. L. Sm. First record: 2000. On soil with rock. Mt. Davidson, *Toren 7764* (CAS).
- Polytrichum juniperinum* Hedw. First record: 1950. On soil among rock outcrops. Glen Canyon, San Miguel Hills, *Shevock 18882* & *18892* (CAS, MO, UC); Mt. Davidson, *Shevock 18922* (CAS, UC), *Toren 7750* (CAS) and *Raven 18* (CAS); Twin Peaks, *Shevock 18867* (CAS, UC); between Marietta Drive and O'Shaughnessy Blvd., *Toren 7808* (CAS); Douglass Playground, *Toren 7777* (CAS); Bay View Park, *Shevock 19010* (CAS, MO, UC); open space (future park) at corner of Castro and 30th Streets, *Toren 8014* (CAS).
- Polytrichum piliferum* Hedw. First record: 2000. On soil among rock outcrops. San Miguel Hills between Marietta Drive and O'Shaughnessy Blvd., *Toren 7809* (CAS); Diamond Heights, Duncan and Newburg Streets, *Toren 8456* (CAS).
- Porotrichum bigelovii* (Sull.) Kindb. First record: 1962. On shaded moist soil and rocks. De Laveaga Dell, Aids Memorial Grove, Golden Gate Park, *F. J. Hermann 17451* (CAS) & *Shevock 19526* (CAS, MO, NY, UC).
- Pseudocrossidium obtusulum* (Lindb.) Crum & Anderson First record: 2000. On soil. Cesar Chavez

- Street at highway 101, *Toren* 7820 (CAS); Bay View Park, *Toren* 7835 (CAS).
- Pseudotaxiphyllum elegans* (Brid.) Iwats. First record: 1973. On shaded clayey soil. Mt. Davidson, *Toren & Wong* 840 (CAS, SFSU) & *Toren* 7804 (CAS); Mt. Sutro, *Shevock* 19179 (CAS).
- Pterogonium gracile* (Hedw.) Sm. [Lesquereux (1868)]. First record: 1868. On rock outcrops and tree trunks. On ground and rocks, *Bolander s.n.*(UC). Although habitat for this species remains in San Francisco we did not encounter it during this study.
- Rhytidadelphus squarrosus* (Hewd.) Warnst. First record: 1976. On lawn. Japanese Tea Garden, Golden Gate Park, *Toren, Showers, & Smith* 2811 (SFSU).
- Scleropodium californicum* (Lesq.) Kindb. [= *Hypnum californicum* (Lesquereux 1868)]. First record: 1868. On soil with leaf litter, rock outcrops and concrete retaining walls. Near the Bay of San Francisco, *Bolander s.n.*(UC); Golden Gate National Recreation Area, Coastal Bluff Trail between Painted Rock Cliffs and Sutro Park, *Shevock* 18808 (CAS, MO, UC) & *Shevock* 18813 (CAS, UC), Fort Miley area, *Shevock* 19371 (CAS, UC) and Alcatraz Island, *Shevock, Toren & Thomas* 20214 (CAS, UC); South Windmill, Golden Gate Park, *Shevock* 18897 (CAS, MO, UC); Fort Point, Presidio of San Francisco, *Toren* 7741 (CAS); Potrero Hill, *Toren* 7828 (CAS); Twin Peaks, *Toren* 7756 (CAS); Bernal Heights Park, *Toren* 7785 (CAS); Bay View Park, *Toren* 7830 & 7840 (CAS); Golden Gate Heights Park, *Toren* 7944 (CAS); Lake Merced, *Toren, Showers & Halling* 1460 (SFSU); Clarendon Heights, *Howe* 523 (CAS); Potrero Hill Park, *Shevock* 19000 (CAS, UC); open space (future park) at Castro and 30th Streets, *Toren* 8019 (CAS); Yerba Buena Island, *Toren* 8059 (CAS), *Shevock* 19112 (CAS, MO, UC), *Shevock* 19120, 20245, 20250 & 20252 (CAS, UC).
- Scleropodium cespitans* (C. Müll.) L. Koch First record: 2000. On clayey soil, base of tree trunks and exposed roots, rock outcrops and concrete retaining walls. Yerba Buena Island, *Toren* 8053 & 8060 (CAS); Walton Park, *Shevock* 19303 (CAS, UC); below Coit Tower, *Shevock* 19108 (CAS, MO, UC); Corona Heights, *Shevock* 18823 & 18826 (CAS, UC); Golden Gate Heights Park, *Shevock* 19198 (CAS, UC); Lafayette Park, *Shevock* 19244 & 19247 (CAS, UC); Holly Park, *Shevock* 19133 (CAS, UC); Grand View Park, *Shevock* 19143 (CAS, UC); Glen Canyon, San Miguel Hills, *Shevock* 18885 (CAS, UC); Golden Gate Park: California Academy of Sciences building, *Shevock* 18755 (CAS, MO, UC), Panhandle, *Shevock* 18771 (CAS, UC); Southeast Farallon Island, Farallon National Wildlife Refuge, *Shevock* 20150 & 20152 (CAS, UC); Presidio of San Francisco: Letterman Complex, *Shevock* 19221 (CAS, UC), Fort Point, *Shevock* 18942 (CAS, UC), Baker Beach, *Shevock* 18949 (CAS, UC).
- Scleropodium colpophyllum* (Sull.) Grout. First record: 2000. On soil and leaf litter, base of tree trunks and exposed roots, and concrete and brick retaining walls. Brotherhood Way near Lake Merced Blvd., *Toren* 7946a (CAS); Mission Dolores Park, *Shevock* 18990 (CAS, UC); Alamo Square, *Shevock* 18908 (CAS, UC); Glen Canyon, *Shevock* 18876 (CAS, MO, UC); Turk & Fillmore Streets, *Shevock* 19342 (CAS, UC); Stern Grove & Pine Lake Park, *Shevock* 19151 & 19152 (CAS, UC); Golden Gate Park: near Conservatory of Flowers, *Shevock* 18803 (CAS, UC), Panhandle, *Shevock* 18766 (CAS, UC), De Laveaga Dell, Aids Memorial Grove, *Shevock* 19520 (CAS, UC) & between Stow Lake and DeYoung Museum, *Shevock* 18758 (CAS, MO, UC); Aquatic Park, Golden Gate National Recreation Area, *Shevock* 19101 (CAS, UC); Alcatraz Island, Golden Gate National Recreation Area, *Toren* 8461 & 8470 (CAS).
- Scleropodium julaceum* Lawt. First record: 2000. On clay soils and rock outcrops. Along Park Presidio (highway 1) between Lake and Sacramento Streets, *Shevock* 19232 (CAS, UC); Potrero Hill Park, 22nd Street between Arkansas and Missouri Streets, *Shevock* 19003 (CAS, UC).
- Scleropodium obtusifolium* (Mitt.) Kindb. in Mac. & Kindb. First record: 2000. On moist clayey soils over rocks. Lincoln Park, Golden Gate National Recreation Area, *Shevock* 19267 (CAS, UC); Red Rock Hill, southeast corner of Duncan St. and Diamond Heights Blvd., *Toren* 8504 (CAS).
- Scleropodium touretii* (Brid.) L. Koch [= *Hypnum illecebrum* (Brandegge 1891)]. First record: 1868. On clayey soil over rocks. Shady sandy ground, San Francisco, *Bolander s.n.* (UC); Glen Canyon, San Miguel Hills, *Shevock* 18874 (CAS, MO, UC); open space (future park) at Castro and 30th Streets, *Toren* 8012 (CAS); Golden Gate Park, *Oberlander s.n.* (SFSU) [det. by Toren]; Twin Peaks, *Shevock* 18866 (CAS, UC); Bernal Heights Park, *Shevock* 19128 (CAS, UC); Yerba Buena Island, *Shevock* 19121 (CAS, UC); Bay View Park, *Shevock* 19012 (CAS, UC); Lone Mountain, University of San Francisco, *Shevock* 19337 (CAS, UC)..
- Sematophyllum adnatum* (Michaux) Britton First record: 2000. On rotten logs. Mt. Davidson, *Shevock* 18929 (CAS, MO, NY, UC) [det. confirmed by Norris]. This collection represents the first documented occurrence of this species for California.
- Syntrichia amplexa* (Lesq.) Zand. [= *Barbula amplexa* (Brandegge 1891)]. First record: 1868. On clayey soil and rocks. Near the Bay of San Francisco, *Bolander s.n.*(UC) and *Blasdale s.n.* (UC); Bay View Park, *Toren* 7836 (CAS); China

Beach, Golden Gate National Recreation Area, *Shevock 19270* (CAS, UC).

*Syntrichia bolanderi* (Lesq. & James) Zand. [= *Barbula bolanderi* (Brandege 1891 & Lesquereux 1868)]. First record: 1868. On soil. In gardens, San Francisco, *Bolander s.n.*(UC). Although habitat for this species still remains in San Francisco, we did not encounter it during this study.

*Syntrichia pagorum* (Milde) Amann First record: 2000. On tree trunks. Panhandle section, Golden Gate Park, *Toren 7799* (CAS); Lafayette Park, *Shevock 19246a* (CAS); Alamo Square, *Shevock 18910* (CAS, UC).

*Syntrichia princeps* (De Not.) Mitt. First record: 1868. On tree trunks, soil over rocks and concrete retaining walls. Mission Dolores, *Bolander s.n.* (UC) [det. by Norris]; Buena Vista Park, *Shevock 18917* (CAS, UC); Twin Peaks, *Toren 7754* (CAS); Yerba Buena Island, *Toren 8055* (CAS), *Shevock 19110* & *19114* (CAS, MO, UC); Pacific Street, Presidio of San Francisco, *Shevock 19352* & *19356* (CAS, UC); Panhandle, Golden Gate Park, *Shevock 18767* (CAS, MO, UC); Alta Plaza, *Shevock 19260* (CAS, UC); Balboa Park, *Shevock 19284* (CAS, UC); Lafayette Park, *Shevock 19233* (CAS, UC); Bay View Park, *Shevock 19008* (CAS, UC); Alcatraz Island, Golden Gate National Recreation Area, *Shevock, Toren & Thomas 20213* & *20216* (CAS, UC).

*Syntrichia ruralis* (Hedw.) Web. & Mohr First record: 1868? On concrete retaining wall. Sand Hills, *E. L. Greene s.n.* (UC); Alta Plaza Park, *Shevock 19258* (CAS, UC) [dets. by Norris].

*Timmia anomala* (Bruch & Schimp. in B. S. G.) Limpr. [= *Trichostomum anomalum* (Brandege 1891)]. First record: 1868. On soil with rock. Near San Francisco, *Bolander s.n.*(UC); Bernal Heights Park, *Shevock 19258* (CAS, MO, UC) [det. by Norris].

*Timmia crassinervis* (Hampe) L. Koch [= *Trichostomum flexipes* (Brandege 1891)]. First record: 1868. On soil with rock. Common on shaded ground and decaying trunks, *Bolander s.n.* (UC); Wayland Street at University Street near McLaren Park, *Toren 7743a* (CAS); Mt. Sutro, *Toren 7775* (CAS); Bernal Heights Park, *Toren 7789* (CAS); Bay View Park, *Toren 7837* (CAS); Yerba Buena Island, *Shevock 19122* (CAS, UC); McLaren Park, *Shevock 19139* (CAS, UC).

*Tortula atrovirens* (Sm.) Lindb. [= *Desmatodon nervosus* var. *edentulus* (Brandege 1891) & *Desmatodon californicus* (Lesquereux 1868)]. First record: 1868. On wall of buildings. Decaying ground of old walls of clay (adobe), San Francisco, *Bolander s.n.* (UC). Although habitat for this species still remains in San Francisco, we did not encounter it during this study.

*Tortula brevipes* (Lesq.) Broth. [= *Barbula brevipes* (Brandege 1891 & Lesquereux 1868)]. First

record: 1868. On buildings. Mud walls, Mission Dolores, in mats an inch broad or more, *Bolander s.n.* (UC). Although habitat for this species still remains in San Francisco, we did not encounter it during this study.

*Tortula latifolia* Bruch ex Hartm. First record: 2000. On concrete retaining walls. Yerba Buena Island, *Toren 8050* (CAS); Lafayette Park, *Shevock 19236* (CAS, MO, UC) [det. by Norris].

*Tortula muralis* Hedw. First record: 1923. On soil, base of tree trunk, boulders, rock outcrops, concrete retaining walls and buildings. San Francisco, *Sudiffe 49* (CAS); Francisco and Hyde Streets, *L. S. Rose s.n.* (CAS); University of San Francisco, Fulton at Parker Street, *Raven s.n.* (CAS); Balboa Street near Arguello, *Raven s.n.* (CAS); Filbert and Van Ness Avenue, *J. T. Howell s.n.* (CAS); 26th Avenue near El Camino del Mar, *Raven s.n.* (CAS); between Fillmore and Laguna Street, *Raven s.n.* (CAS); Alamo Square, *Shevock 18913* (CAS, UC); Yerba Buena Island, *Shevock 19118a* & *20244* (CAS, UC); Potrero Hill Park, *Shevock 19002* (CAS, UC); Jefferson Square, *Shevock 18899* & *18904* (CAS, UC); Golden Gate Park: South Windmill, *Shevock 18895* (CAS, MO, UC), Fulton near 1st Avenue, *J. T. Howell s.n.* (CAS), Stanyon Street between Fulton & Hayes Streets, *Shevock 18834* & *18835* (CAS, UC), Quarry Lake, *Raven 5* (CAS), Stow Lake, *Shevock 18757* (CAS, UC) and De Lavaca Dell, Aids Memorial Grove, *Shevock 19522* (CAS, UC); Cesar Chavez Street at highway 101, *Toren 7814* (CAS); Lookout Point, *Halling 600* (SFSU) [confirmed by Toren]; Glen Canyon, San Miguel Hills, *Shevock 18879* (CAS, UC); Turk & Fillmore Streets, *Shevock 19340* (CAS, UC); Aqua Vista Park, *Shevock 18998* (CAS, UC); Alta Plaza Park, *Shevock 19261* (CAS, UC); Lafayette Park, *Shevock 19235* (CAS, UC); Presidio of San Francisco: Coastal Bluff Trail near Golden Gate Bridge, *Shevock 18940* (CAS, UC) and near Arguello Gate, *Shevock 19362* (CAS, UC); Golden Gate National Recreation Area: Sutro bath site, *Shevock 19215* (CAS, UC) and Aquatic Park, *Shevock 19099* (CAS, UC).

*Tortula obtusifolia* (Schwaegr.) Math. [as *Desmatodon flavicans*, not in Brandege 1891]. First record: 1868. On soil? Mission Dolores, *Bolander s.n.* (UC) [det. confirmed by Toren]. Although habitat for this species remains in San Francisco we did not encounter it during this study.

*Tortula papillosa* Wils. in Spruce First record: 2000. On tree trunks and concrete retaining wall. Twin Peaks, *Toren 7245* (CAS); Alta Plaza Park, *Shevock 19254* & *19257* (CAS, UC); Balboa Park, *Shevock 19281* (CAS, UC) & *Shevock 19282* (CAS, MO, UC); Jefferson Square, *Shevock 18900* (CAS, MO, UC); Lafayette Park, *Shevock 19251* (CAS, MO, UC); Presidio Golf Course, Presidio of San Francisco, *Shevock*

- 19364 (CAS, UC); Third Street at Burke Street, *Shevock 20201* (CAS, UC).
- Tortula plinthobia* (Sull. & Lesq.) Broth. First record: 2000. On bark of poplars. Third Street at Burke and Custer Streets, *Shevock 20206* (CAS, UC).
- Triquetrella californica* (Lesq.) Grout First record: 2000. On soils and rock outcrops. Tank Hill, *Shevock 18920* (BUF, CAS, UC) [confirmed by Zander]; Clipper Street at Douglass Playground, *Toren 7778* (CAS); open space (future park) at Castro and 30th Streets, *Toren 8013* (CAS); Diamond Heights, Duncan and Newburg Streets, *Toren 8455* (CAS).
- Vesicularia vesicularis* (Schwaegr.) Broth. First record: 1923. Wet areas of lawn. Golden Gate Park, *Bradshaw s.n.*(CAS), *Wagner s.n.*(CAS) and the Conservatory, *Toren 688* (CAS, SFSU).
- Weissia controversa* Hedw. [= *Weissia viridula* (Brandege 1891 & Lesquereux 1868)]. First record: 1868. On soil. At and around San Francisco, *Bolander s.n.*(UC); Mt. Davidson, *Toren 7768* (CAS); Brotherhood Way near Lake Merced Blvd., *Toren 7946c* (CAS); Aquatic Park, Golden Gate National Recreation Area, *Shevock 19095* (CAS, UC); open space at 30th & Castro St., *Shevock 19348* (CAS, UC).
- Zygodon menziesii* (Schwaegr.) Arnott First record: 2000. On trunks of *Eucalyptus* and *Myoporum*. Panhandle section of Golden Gate Park, *Toren 7797* (CAS) and *Shevock 18773* (ALTA, CAS, MO, UC); Jefferson Park, *Shevock 18901* (ALTA, CAS, NY, UC) [dets.confirmed by Vitt]; Diamond Heights, Duncan Street and Cameo Way, *Toren 8159* (CAS). These collections represent the first documented occurrences of this species for California and North America.
- Zygodon rupestris* (Lindb. ex Hartm.) Lindb. ex Britt. First record: 1976. On trunks of *Eucalyptus* and *Cupressus*. St. Francis Blvd., *Toren 5001* (CAS); Mt. Davidson, *Toren 7759* (CAS); Golden Gate Park, Panhandle, *Toren 7796* (CAS); Golden Gate Heights Park, *Toren 7939* (CAS) & *Shevock 19201* (ALTA, CAS, MO, UC); Lafayette Park, *Shevock 19246* (CAS, NY, UC) & *19250* (ALTA, CAS, MO, UC).